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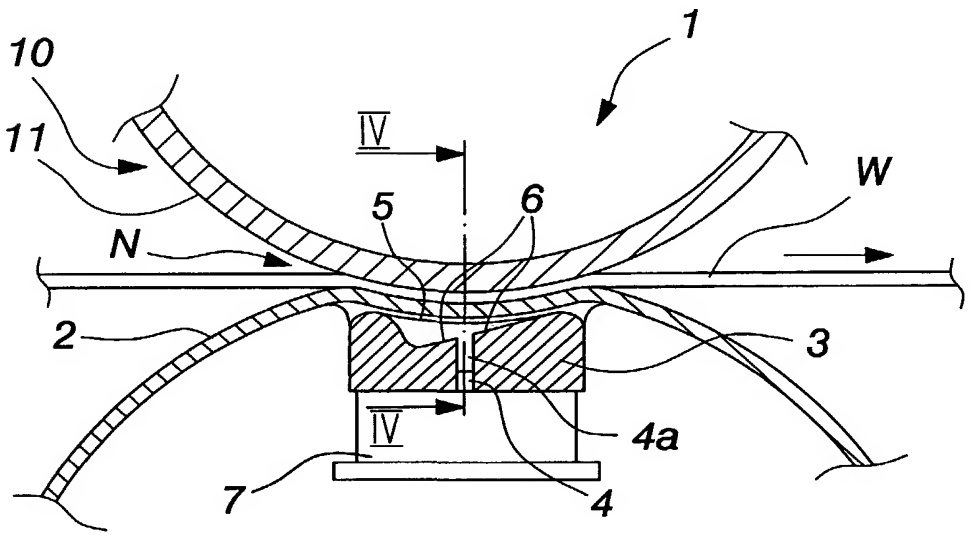
For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) **Title:** LONG-NIP PRESS OF A PAPER/BOARD MACHINE



(57) **Abstract:** The present invention relates to a long-nip press (1) of a paper/board machine, which comprises a press shoe (3), a belt (2) arranged to run in the machine direction over the press shoe (3), a backing roll (10), between which backing roll (10) and belt (2) is formed a nip (N) at the press shoe (3), through which nip a material web (W) is led. On the press shoe (3) is formed at least one pocket (6), into which pocket is fed hydraulic medium through a flow path (4, 4a, 4', 8) made in made in the press shoe (3) and/or in conjunction with the press shoe (3). The flow path (4, 4a, 4', 8) comprises a groove-like channel or a slit nozzle (4a) formed in the press shoe (3), which groove-like channel or slit nozzle (4a) is connected to the pocket (6), and which extends essentially over the total distance of the pocket (6) in the lateral direction of the nip (N).

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Long-nip press of a paper/board machine

The present invention relates to a long-nip press of a paper/board machine, which comprises a press shoe, a belt arranged to run in the machine direction over the press shoe, a backing roll, between which backing roll and the belt is formed a nip at the press shoe, through which nip a material web is led, at least one pocket formed on the press shoe, into which pocket is fed hydraulic medium through a flow path made in conjunction with the press shoe.

A long-nip press usually comprises a press shoe and a backing roll, which is, for example, a thermo-roll. An endless belt is arranged to run over the press shoe. At the press shoe, between the belt running over the press shoe and the backing roll is, due to the shape of the press shoe, formed a long nip in the machine direction, through which the material web formed of paper or board is led. The press shoe is loaded by means of hydrostatic load elements provided under the shoe. The load elements are described, for example, in the patent publication EP 345,501. On the surface of the press shoe facing the belt are formed several pockets or recesses for the hydraulic medium, which are successive in the lateral direction of the nip and separated by necks. In each pocket is separately arranged its own feed channels or flow paths for the hydraulic medium. The hydraulic medium is preferably oil. An arrangement of this type is disclosed in published application no. WO 99/16968.

Figures 1 and 2 show diagrammatically a prior art long-nip press solution in which the press shoe is marked by reference numeral 3, the press shoe 3 load element by reference numeral 7, and the pockets by reference numeral 6. The feed channels, through which oil is fed to the pockets 6 are marked by reference numeral 4. The hydraulic medium feed channels 4 may be connected either to a separate medium feed source (not shown) or the feed channels 4 may be connected to the hydraulic system of the load elements

7, from where the hydraulic medium is fed to the pockets 6 via the feed channels 4.

In this type of a solution, the hydraulic medium, such as oil, is fed into the pockets through flow pipes or flow channels formed in the press shoe at equal distances in the lateral direction. This may for its part bring about an uneven thickness profile of the material web after the nip. The discharge of the hydraulic medium through holes into the pockets creates precisely at the hole, in the lateral direction of the nip, a greater nip pressure than elsewhere, and the material web is not worked, for example, calendered evenly.

The aim of the present invention is to eliminate or substantially reduce the above-mentioned drawbacks.

This aim is achieved by means of a long-nip press of a paper/board machine, which is characterised in that the flow path comprises a groove-like channel or a slit nozzle formed in the press shoe, which groove-like channel or slit nozzle is connected to the pocket, and which extends essentially over the total distance of the pocket in the lateral direction of the nip.

Preferred embodiments of the present invention are disclosed in the dependent claims.

The present invention is described in greater detail in the following, with reference to the accompanying Figures, of which

Figures 1 and 2 represent the prior art,

Figure 3 shows a long-nip press according to the invention,

Figure 4 shows a sectional view of Figure 3 taken along line IV-IV,

Figure 5 shows an axonometric view of the press shoe according to the invention, and

Figure 5A shows an axonometric view of a press shoe according to another embodiment.

Figure 3 shows diagrammatically a long-nip press according to the invention, which is marked by reference numeral 1. Figure 4 shows a sectional view of Figure 3 taken along line IV-IV. The long-nip press 1 comprises a press shoe 3 and a backing roll 10. Over the press shoe 3 is arranged to run an endless belt 2, at least the surface of which is of an elastic material, such as polyurethane. The press shoe 3 is loaded against the backing roll 10 by means of load elements 7, which are located in succession in the lateral direction of the nip N, preferably over the total distance of the nip N. The load elements 7 may be arranged in the longitudinal direction of the nip N in two successive rows. The material web W is led through the nip N remaining between the backing roll 10 and the belt 2 running over the press shoe 3. The material of the material web W is paper or board. The backing roll is, for example, a thermo-roll.

The width of the press shoe 3 and the belt 2 running over it is here at least the same as that of the material web W. The load elements 7 are preferably hydrostatic cylinders, wherein the pressure of the hydrostatic medium fed to them presses the press shoe 3 against the backing roll 10.

On the surface of the press shoe 3 facing the backing roll 10 is formed a pocket 6. The Figures show a pocket 6, the width of which in the lateral direction of the nip N equals that of the material web W, preferably that of the nip N, whereby one wide pocket 6 is formed on the press shoe 3. Several pockets 6 may, however, be formed in the lateral direction of the nip N,

preferably 2 to 20 pockets, in which case each pocket 6 is separated from the adjacent pocket by a neck 5, as shown in Figures 1 and 2.

Lubricating oil is fed into the pocket 6 along the flow path 4, 4a opening to its bottom. In an individual pocket 6 is formed a groove-like channel or a slit nozzle 4a, the width of which is substantially equal to that of the pocket 6. Lubricating oil is fed into this slit nozzle 4a through feed channels 4 formed on the press shoe 3 and opening onto the bottom of the slit nozzle 4a. Feed channels 4 are located at the bottom of the slit nozzle 4a preferably at equal distances over the total distance of the pocket 6 in the lateral direction, preferably 2 to 20 channels depending on the width of the pocket 6 in the direction of the nip N. The distance of successive feed channels 4 with respect to each other is such that the pressure of the lubricating oil is distributed evenly in the slit nozzle 4a in the lateral direction of the nip N before flowing into the pocket 6. This means that the hydraulic medium flows into the pocket 6 in the lateral direction of the nip N at constant pressure.

In this lateral direction of the nip N, successive flow channels 4 are connected in a previously known manner to the hydraulic system of the load elements 7, from where the pressurised hydraulic medium can be fed to the flow channels 4, and it is not necessary to describe this structure in any greater detail in this connection.

In the following is described another embodiment of the invention, where the difference to the first embodiment is that the structure of the flow path of the press shoe 3 is such that it comprises only a groove-like channel or a slit nozzle 4a, whereby the press shoe 3 does not comprise several feed channels 4 distributed in the lateral direction of the pocket 6. This means that the feeding of hydraulic medium to the slit nozzle is arranged essentially outside the press shoe 3, in conjunction with the press shoe 3. One such arrangement is shown diagrammatically in Figure 5A.

In the press shoe 3 is formed a groove-like channel or slit nozzle 4a, which opens from its first end to pocket 6 and from its other end to the lateral face 3a of the press shoe 3, while the other end forms an input opening for the slit nozzle 4a, through which input opening the hydraulic medium is fed to the slit nozzle 4a. The width of the input opening in the direction of the nip N equals at least essentially that of one pocket 6, at most, however, the width of the nip N. The hydraulic medium is fed into the slit nozzle 4a and from there further to the pocket 6 through a long flow pipe 8 or the like comprised in the separate hydraulic medium feeding system. The flow pipe 8 is an elongated pipe preferably fixed removably on the lateral surface 3a of the press shoe 3 at the input opening. In the flow pipe 8 are formed lead-through channels 4', which open at the input opening of the slit nozzle 4a, preferably at equal distances in the lateral direction of the nip N. The lead-through channels 4' thus act as external feed channels 4' of the press shoe 3 between the separate feeding system 8 and the slit nozzle 4a. Lead-through channels 4' are formed in the flow pipe 8 in such a way that hydraulic medium is fed into each pocket 6 through at least one, preferably 2 to 20 lead-through channels, that is, feed channels 4', depending on the number of pockets 6 in the lateral direction of the nip N. The number of lead-through channels 4' may deviate from that disclosed depending on, for example, the width of the long-nip press 1, the shape of the external feed channels 4' and the number of pockets 6. The external feed channels 4' of the load shoe 3 and the flow pipe solutions 8 may be realised by structural solutions deviating from that disclosed, which may be included within the scope of protection constituted by the claims. The flow pipe 8, for example, can be formed of several parts or this arrangement can be implemented on some other surface of the press shoe that the lateral surface 3a, for example on the surface on the side of the load element 7.

Claims

1. A long-nip press (1) of a paper/board machine, which comprises a press shoe (3), a belt (2) arranged to run in the machine direction over the press shoe (3), a backing roll (10), between which backing roll (10) and belt (2) is formed a nip (N) at the press shoe (3), through which nip a material web (W) is led, at least one pocket (6) formed on the press shoe (3), into which pocket is fed hydraulic medium through a flow path (4, 4a, 4', 8) made in the press shoe (3) and/or in conjunction with the press shoe (3), **characterised** in that in that the flow path (4, 4a, 4', 8) comprises a groove-like channel or a slit nozzle (4a) formed in the press shoe (3), which groove-like channel or slit nozzle (4a) is connected to the pocket (6), and which extends essentially over the total distance of the pocket (6) in the lateral direction of the nip (N).

2. A device as claimed in claim 1, **characterised** in that the width of the pocket (6) is essentially the same as the width of the nip (N).

3. A device as claimed in claim 1, **characterised** in that on the press shoe (3) are formed several successive pockets (6), preferably 2 to 20 pockets, in the lateral direction of the nip N.

4. A device as claimed in any of the claims 1 to 3, **characterised** in that in the press shoe (3) and/or in connection with the press shoe (3) is arranged, in the lateral direction of the nip (N), at least one feed channel (4, 4'), preferably 2 to 20 feed channels (4, 4'), through which the hydraulic medium can be fed into the groove-like channel or slit nozzle (4a).

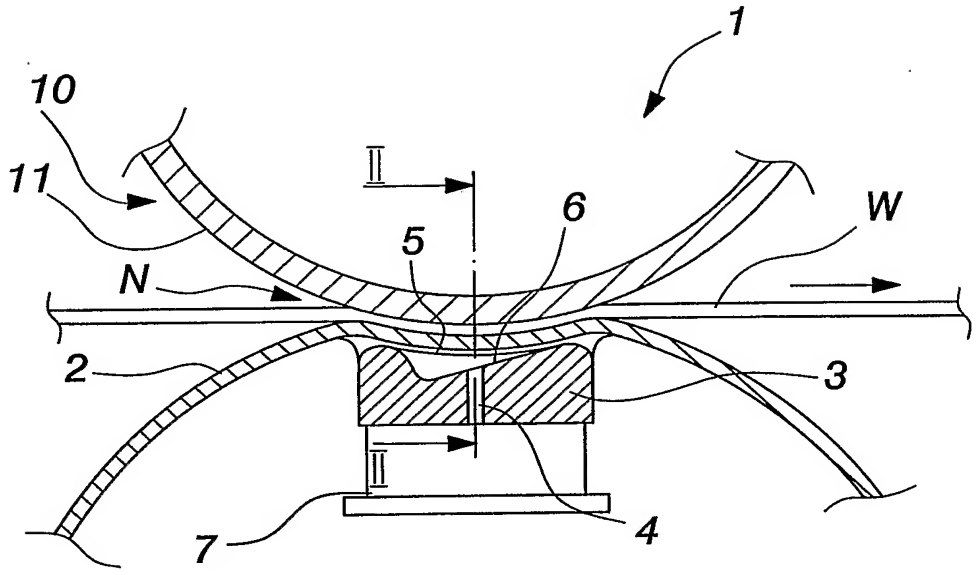

Fig.1 (Prior art)

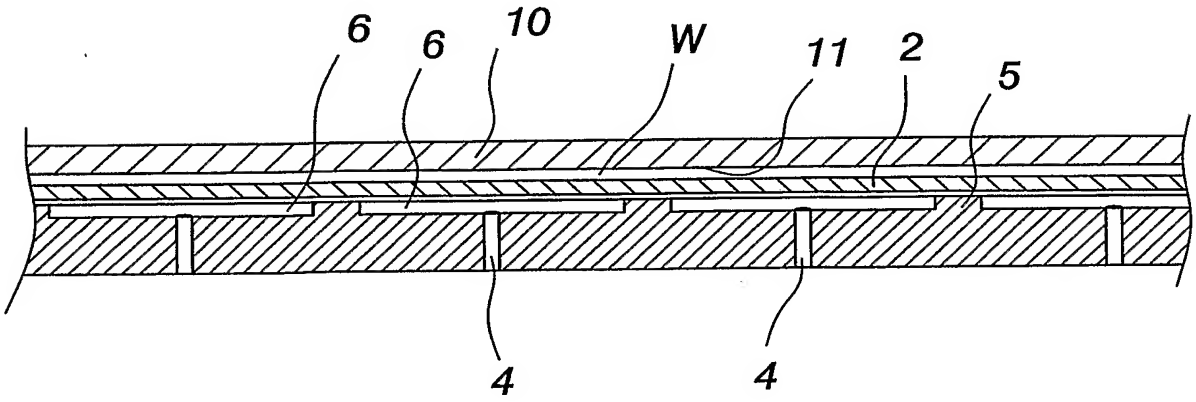

Fig.2 (Prior art)

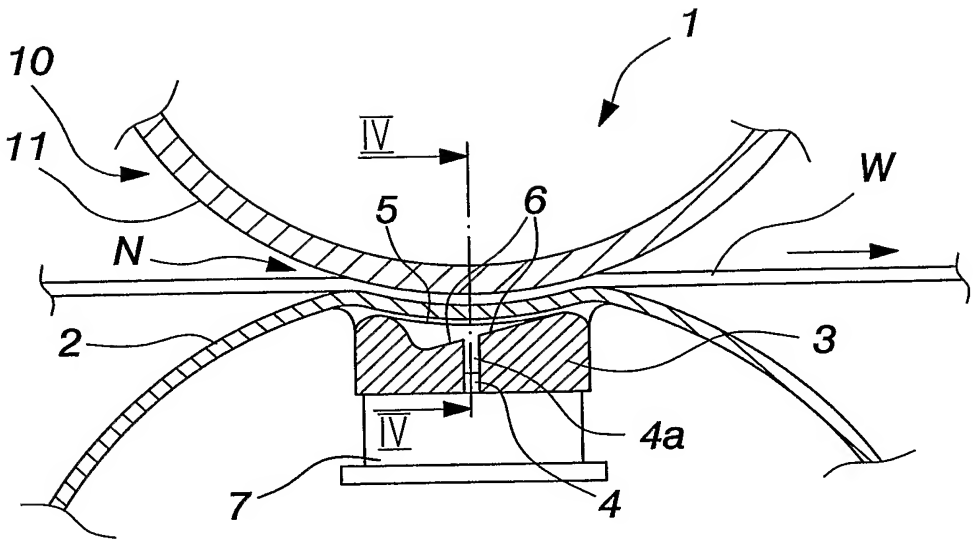

Fig.3

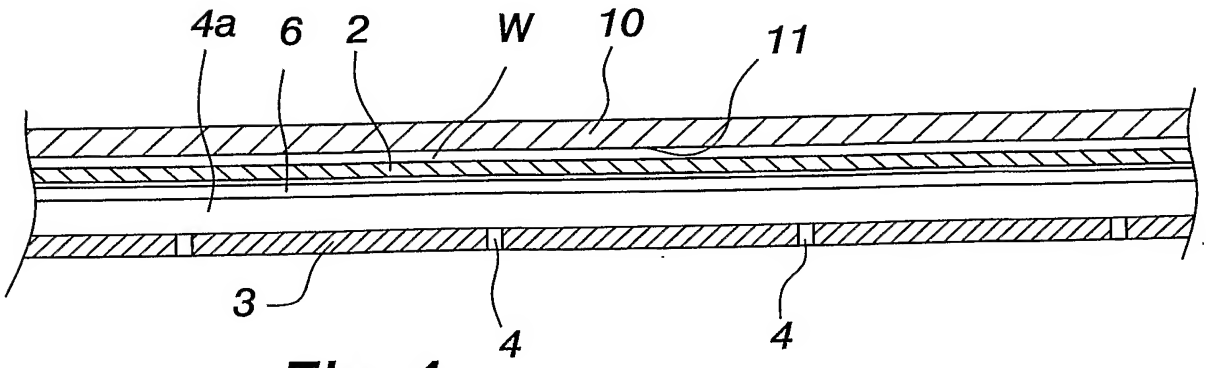

Fig.4

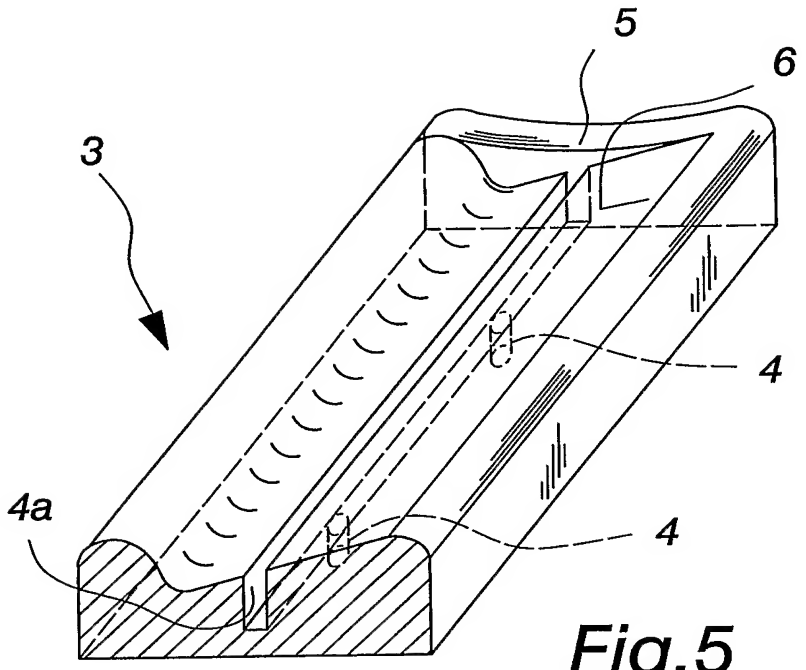

Fig.5

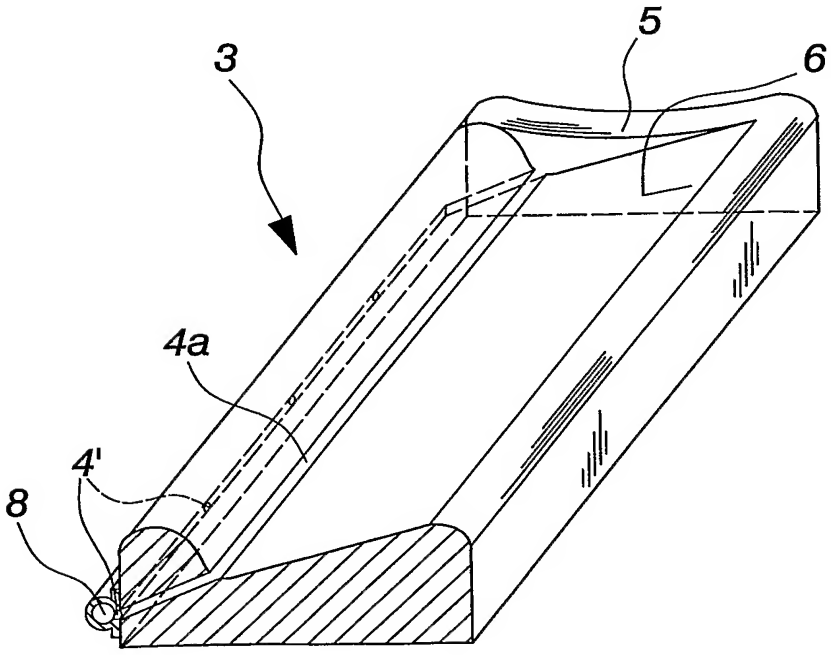

Fig.5A

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 03/00242

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: D21F 3/02
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: D21F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9916968 A1 (VALMET-KARLSTAD AB), 8 April 1999 (08.04.99) --	1
A	EP 0345501 A1 (VALMET PAPER MACHINERY INC.), 13 December 1989 (13.12.89) -- --------	1

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
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"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
6 June 2003	23 -06- 2003
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Olov Jensén/MP Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (July 1998)

INTERNATIONAL SEARCH REPORT

Information on patent family members

29/04/03

International application No.
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9916968 A1	08/04/99	AT 3119 U	25/10/99
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DOCUMENT-IDENTIFIER: WO 3083210 A1

TITLE: LONG-NIP PRESS OF A PAPER/BOARD MACHINE

PUBN-DATE: October 9, 2003

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EUR-CL (EPC): D21F003/02

ABSTRACT:

CHG DATE=20031203 STATUS=O>The present invention relates to a long-nip press (1) of a paper/board machine, which comprises a press shoe (3), a belt (2) arranged to run in the machine direction over the press shoe (3), a backing roll (10), between which backing roll (10) and belt (2) is formed a nip (N) at the press shoe (3), through which nip a material web (W) is led. On the press shoe (3) is formed at least one pocket (6), into which pocket is fed hydraulic medium through a flow path (4, 4a, 4', 8) made in made in the press shoe (3) and/ or in conjunction with the press shoe (3). The flow path (4, 4a, 4', 8) comprises a groove-like channel or a slit nozzle (4a) formed in the press shoe (3), which groove-like channel or slit nozzle (4a) is connected to the pocket (6), and which extends essentially over the total distance of the pocket (6) in the lateral direction of the nip (N).